REMARKS

Claims 23-54 are pending in the Subject Application; of these claims 23-35 and 44-54 are withdrawn from consideration.

OBJECTIONS

In Office Action, the Examiner objects to the wording of claims 36 and 39, indicating that the phrase "at least one of niobium, titanium, and tantalum," is improper group language under MPEP §2173.05(h). Applicant has amended claims 36 and 39 according to the Examiner's suggestion.

REJECTIONS

In the Office Action, the Examiner rejects claims 36-40, 42, and 43 under 35 U.S.C. §103(a) as being unpatentable over United States Patent No. 6,613,468 issued to Simpkins ("Simpkins") in view of JP 2000-294256 filed by Taruya et al. ("Taruya").

Applicant respectfully traverses the rejection of claims 36-40, 42, and 43. There are three basic criteria that must be met to result a *prima facie* case of obviousness in United States patent law. First, there must be some suggestion or motivation, either in the references or in the knowledge generally available in the art, to modify the reference or to combine the reference teachings. Second, there must be a reasonable expectation of success. Finally, the prior art references must teach or suggest all of the claim limitations. *See* Manual of Patent Examining Procedure ("MPEP") § 2143. Applicants respectfully submit that a *prima facie* case of obviousness has not been reached by the combination of references cited in the Office Action, for at least the reasons that there is no suggestion or motivation to modify the reference, there would be no reasonable expectation of success, or to combine the reference teachings and the prior art does not teach all of the claim limitations.

In the Office Action, the Examiner states that Simpkins teaches a solid oxide fuel cell ("SOFC") comprising an electrolyte disposed between and in ionic communication with an anode and a cathode to form an electrochemical cell. The solid oxide fuel cell further includes an interconnect. The solid fuel electrolyte may comprise zirconium oxide. The interconnect is electrically

conductive and may comprise a ferritic stainless steel material (6:46-67). Applicant respectfully submits that the pending claims of the subject application are directed to a solid oxide fuel cell as in Simpkins.

However, more specifically, Simpkins states that "[p]referably the interconnects 80, 82 comprise lanthanum chromite doped with an alkaline earth element. More preferably, the interconnects 80, 82 comprise strontium-doped lanthanum chromite (LSC). Also, metals, such as ferritic stainless steels, nickel, chrome, aluminum alloys, may be coated with LSC or strontium-doped lanthanum manganite (LSM) to achieve the same desired properties." *See* Simpkins 6:60-67. Simpkins discloses use of a ferritic stainless steels that are coated with exotic materials may be used as interconnects in solid oxide fuel cells, thereby teaching away from a simple steel with the claimed composition. In this regard, there is no <u>suggestion or motivation</u>, either in the references or in the knowledge generally available in the art, to modify Simpkins in view of Taruya or to combine the reference teachings. Though both disclosures concern fuel cells there is no discussion of the general application of the materials for one type of fuel cell for use in another.

Taruya teaches a solid polymer-type fuel cell comprising a separator having a specific ferritic stainless steel composition. According to the Examiner, the ferritic stainless steel of Taruya includes 10.5-35 wt.% chromium, 0-6 wt.% molybdenum, not more than 0.018 wt% carbon, not more than 0.2 wt.% titanium and not more than 0.3 wt.% niobium. Further, the Examiner indicates that at paragraph [0020], Taruya discloses the use of a ferritic stainless steel separator in a solid oxide fuel cell, and further teaches at paragraph [0041] that the ferritic stainless steel preferably contains 0.5-5 wt.% molybdenum.

The fuel cell of Taruya is a Polymer Electrolyte Membrane ("PEM") Fuel Cell, while the fuel cell of Simpkins is a SOFC. As one skilled in the art recognizes PEM fuel cells and SOFC's are quite different, not only are the materials of construction quite different, the modes of operation and the operating conditions are also quite different. For example, PEM fuel cells operate at low temperatures, typically around 80°C (less than the boiling point of water!) while SOFC operate at high temperatures, typically between 800°C

and 1200°C, ten or more times greater than the operating temperature of a PEM fuel cell. *See* Simpkins 2:47-50. PEM fuel cells may only operate on a clean hydrogen fuel; while SOFC may operate with a wider variety of fuels, the operation of an SOFC is tolerant of sulfur and carbon monoxide (CO will poison the platinum catalyst in a PEM fuel cell but may actually be used as a fuel in an SOFC.) in the feed. SOFC's use a hard, nonporous ceramic compound electrolyte; while PEM fuel cells use a solid polymer electrolyte. The solid polymer electrolyte of a PEM fuel cell would not withstand the operating conditions of an SOFC. The high operating temperatures also allow a wider variety of fuels to be used in an SOFC, including gases made from coal. Even the modes of operation of the PEM fuel cell and the SOFC are different. In a PEM, ionized hydrogen passes through the polymeric membrane electrolyte; while in an SOFC ionized oxygen passes through the hard ceramic electrolyte. *See* Simpkins 1:34-36 and, for example, the U.S. government web site www.eere.energy.gov/hydrogenandfuelcells/fuelcells/fc_types.html. One skilled in the art would not have a reasonable expectation of success in using materials from a PEM fuel cell in the harsher environment of an SOFC due to the difference in modes of operation and the operating conditions. Taruya supports this assertion and actually teaches away from the use of the disclosed ferritic stainless steel separators other fuel cells. For example, Taruya teaches that these different types of fuel cells can be distinguished, in part, by their operating conditions. For example, the disclosure of Taruya at [0003] confirmss that the rough operating temperature of a solid polymer-type fuel cell is about 80°C, while solid electrolyte-type fuel cells, such as SOFC's, operate at temperatures around 1000°C.

Taruya then goes on to indicate that "[w]ith each of the aforementioned types of fuel cells, in cases when we think about the individual constituent materials of items that are referred to by the common name of 'fuel cell,' *it is necessary for them to be batched as completely different things.*" Taruya at [0005] (emphasis added). This is because the operating conditions within the fuel cell are completely different for each fuel cell type. Accordingly, "it is not possible to consider the application of materials used in commercialized phosphoric acid-type fuel cells and fused carbonate-type fuel

cells in the constituent material of a solid polymer-type fuel cell." Taruya at [0006].

Thus, Taruya teaches that there would be no reasonable expectation of success in using components designed for use in one type of fuel cell in other types of fuel cells. Accordingly, Applicant submits that one skilled in the art, in reading the disclosures of Simpkins and Taruya would not be motivated to use the disclosed ferritic stainless steel separator for a PEM fuel cell in an SOFC, and further, in view of the teachings of Simpkins and Taruya, one skilled in the art would have no reasonable expectation of the success of such a combination. Therefore, Applicant submits that the pending claims are not rendered obvious by the disclosure of Simpkin in view of the disclosure of Taruya. Applicant's respectfully submit that the disclosure of Taruya is confined to the use of the disclosed ferritic stainless steel separators in PEM fuel cells for the reasons provided in the Response to Office Action filed on June 21, 2005.

Accordingly, in reading the disclosure of Taruya as a whole, it is apparent that Taruya discloses and relates to solid **polymer-type** fuel cells, rather than solid-oxide fuel cells. Further, Applicant asserts that Taruya does not disclose or suggest the use of a ferritic stainless steel as set forth in amended claim 36 for use as a separator in any fuel cell type. Claim 36 recites, in pertinent part,

> a ferritic stainless steel including
> greater than 25 weight percent chromium,
> 0.75 up to 1.5 weight percent molybdenum,
> up to 0.05 weight percent carbon, and
> at least one of niobium, titanium, and tantalum,
> wherein the weight percentages of niobium, titanium, and tantalum satisfy the equation
> $0.5 \leq (\%Nb + \%Ti + \frac{1}{2}(\%Ta)) \leq 1$,. . .

At paragraph [0025], Taruya discloses "A solid polymer-type fuel cell ...for which the ferrite stainless steel contains one or two types of Ti and Nb, Ti is less than 0.2% by weight percent and within the range 6(C%+N%) – 25(C%+N%), and Nb is less than 0.3% and with a range of 6C%-25C%." Taruya further teaches the reason for the selection of these specific levels of Ti and Nb. Since the alloy of Taruya does not include the addition of tantalum,

the limitation in the claims that "$0.5 \leq (\%Nb + \%Ti + \frac{1}{2}(\%Ta)) \leq 1$" cannot be met by the alloy of Taruya. Further, not of the alloys of Table 1, or otherwise disclosed in Taruya or Simpkins have the claimed composition.

Further, since Taruya teaches that it is generally not desirable in increase the amounts of the Ti and Nb in the disclosed ferritic stainless steels beyond that specified ranges, Applicant submits that Taruya actually teaches away from using an amount of Ti, Nb, and Ta that would satisfy the equation set forth in claim 36. Consequently, one skilled in the art in reading the disclosure of Taruya <u>would not be motivated</u> to formulate a ferritic stainless steel for use as a separator in any type of fuel cell wherein the ferritic stainless steel contained an amount of at least one of Ti, Nb, and Ta as set forth in amended claim 36.

Consequently, Applicant respectfully submits that Simpkin in view of Taruya neither anticipates nor renders obvious claim 36 or any of the claims that depend therefrom, and requests that the Examiner reconsider the patentability of the pending claims.

CONCLUSION

Applicants believe that they have fully addressed each basis for rejection under § 103(a). Reconsideration of the claims of the subject application and issuance of a Notice of Allowability is respectfully requested. Should the Examiner have any remaining concerns, he is requested to contact the undersigned at the telephone number below so that those concerns may be addressed without the necessity for issuing an additional Office Action.

Respectfully submitted,

Bernard G. Pike
Registration No. 46,993
Attorney for Applicants

Kirkpatrick & Lockhart Nicholson Graham LLP
Henry W. Oliver Building
535 Smithfield Street
Pittsburgh, PA 15222-2312
Phone: (412) 355-8620
Facsimile: (412) 355-6501